becoming too cold for them on deck, and then the more electric light they have the better."

Out of the whole consignment to the various islands only ten plants succumbed; but this was due to an oversight in carrying the case on to Trinidad and La Guayra, and having to bring it back again to St. Vincent, thereby causing a delay in landing of ten days.

Mr. Morris visited successively Antigua, Dominica, Montserrat, St. Kitts, Anguilla, Tortola, Santa Lucia, St. Vincent, Grenada, Barbados, and Jamaica, being present at the opening of the Exhibition at the last-named island. Everywhere the Governors and other officials seem to have done their utmost, both personally and indirectly, to assist Mr. Morris in fulfilling the object of his mission. Established gardens were inspected, sites for new gardens selected, means discussed, and addresses delivered, from which it is confidently hoped that substantial advantages to the cultural industries may accrue.

Mr. Morris's Report, which may be obtained for the sum of fourpence, is a valuable and interesting account of the present condition and future prospects of planting in the various islands, and should be in the hands of all concerned. We conclude this notice with an extract from a description of the lime plantations in Montserrat, "where the immense golden heaps of ripe fruit were alone worth a journey to the West Indies."

"The West Indian lime (*Citrus medica*, var. *acida*) appears to be a thin-skinned local variety, little known outside the West India Islands. It yields juice of a singularly pure acid flavour, and it deserves to be much better known in this country in the fresh state for making 'lemon' beverages, as well as for general use in cookery. The enterprise of the Montserrat Company extends to other things besides limes. Nevertheless, from limes alone it is possible to produce a variety of articles more or less valuable. The limes themselves are exported as gathered, or they are preserved in salt water, and shipped in a pickled state for consumption in certain parts of the United States. Lime-juice, obtained by compression, is exported either raw or in a concentrated state. This latter is obtained by evaporating the raw juice in boilers until it is reduced to about one-twelfth of the original bulk, when it is ready for export as a dark, viscid substance like molasses. This is used for the preparation of commercial citric acid. From the rind of the fruit, by a process known as 'ecuelling,' which consists of gently rubbing the fruit on rounded projections arranged inside a brass basin, a very fine essence of limes is obtained. Again, by distilling the raw lime-juice a spirit is obtained known as oil of limes."

NOTES.

THE deputation which is to submit to Sir Michael Hicks Beach to-morrow a statement of the facts relating to the proposed British Institute of Preventive Medicine, will be large, influential, and thoroughly representative of the various departments of science. It is expected that the following gentlemen will speak: Sir Joseph Lister, the Duke of Westminster, Sir Henry Roscoe, Prof. Dewar, Mr. Haldane, M.P., Q.C., and Prof. Ray Lankester. A letter from Prof. Huxley will be read.

THE list of those selected for Birthday Honours includes Dr. Archibald Geikie, on whom the honour of knighthood has been conferred, and Mr. Robert Giffen, who has been made C.B.

IN the course of an investigation, part of which has already been communicated to the Royal Society, Prof. Roberts-Austen has discovered the most brilliantly coloured alloy as yet known. It has a rich purple colour, and bright ruby tints are obtained when light is reflected from one surface of the alloy to another. It contains about 78 per cent. of gold, the rest of the alloy being aluminium. The constants of the aluminium-gold series of alloys are now being examined, and will shortly be published.

ON Tuesday last, at Oxford, Convocation sanctioned the expenditure of very considerable sums of money in order to provide increased accommodation for the medical and science schools. The Lecturer in Human Anatomy, Mr. Arthur Thomson, estimated that the immediate wants of his department necessitated the expenditure of £7000. With this sum might be provided a laboratory, which would include dissecting-rooms, a museum, working rooms, and a lecture theatre. Hitherto the accommodation provided for the lecturer has been of a temporary character, and has now proved itself utterly inadequate for the requirements of his class. The number of students now studying in Oxford with the intention of passing the M.B. examination is 67. As illustrating the growth of the class, and the interest taken in this school, it may be mentioned that in 1885 the lecturer's class consisted of only three members. The Deputy Professor of Physiology (Dr. Ray Lankester) required the more modest sum of £2000 in order to supply the deficiencies in the department of Morphology. With this sum two laboratories could be provided, one 40 × 20 feet, and the other 30 × 20 feet. Meanwhile the departments of Ethnology and Geology find themselves cramped for space at the University Museum, and Convocation has granted the sum of £1300 to provide rooms for the use of the Curator and the servants of the Museum, and increased accommodation for teaching. The Hope Professor of Zoology (Prof. Westwood) needed only the expenditure of £350 upon additions and improvements in his department at the University Museum. The expenditure of these various sums, amounting in the aggregate to nearly £11,000, will place the School of Medicine and the related sciences in a satisfactory position, and the University of Oxford is to be congratulated on its appreciation of the importance of these departments, and the liberality with which it maintains them.

THE Gold Medal of the Linnean Society has this year been awarded to Dr. Edouard Bornet, of Paris, for distinguished researches in botany. His earliest publications related to the structure and life-history of Fungi and Lichens, but his name is best known for the important researches in which, with his friend M. Thuret, he has been for some years engaged, on the life-histories of Algæ, and for his valuable contributions on this subject in the "Études Phycologiques," and the "Notes Algologiques," with their beautiful illustrations.

AT a meeting of the Ashmolean Society, Oxford, on June 1, there was an interesting discussion on a paper, by Mr. Romanes, on Weismann's theories of heredity, in which Prof. Lankester and Mr. Poulton took prominent parts.

M. DOULIOT, Demonstrator in Botany at the Museum of Natural History, Paris, has undertaken a scientific expedition to Madagascar.

MR. NORMAN LOCKYER, F.R.S., has undertaken to give a lecture at Bedford College (for Ladies), Baker Street, on Wednesday next, at o'clock, "On Natural Philosophy for Artists."

WE regret to have to record the death of Sir John Hawkshaw, F.R.S. He died on Tuesday last at his town residence, Belgrave Mansions, in his 81st year. The greatest of his many engineering feats was the construction of the Severn Tunnel. He was President of the Institution of Civil Engineers in 1862–63, and of the British Association at its Bristol meeting in 1875. He received the honour of knighthood in 1873.

SEVEN years have elapsed since the first International Ornithological Congress took place in Vienna, under the presidency of the late Crown Prince Rudolph. England was on that occasion, as a correspondent wrote at the time, "conspicuous by her absence," and at the second Congress, which has just been held at Budapest, Great Britain was but feebly represented. It is difficult to understand this unwillingness of Englishmen to visit an International Congress. Our countrymen are always sure of a hospitable reception, the interchange of ideas with foreign colleagues is pleasant and profitable, the personal friendships which result are of permanent value, and in the case of Museum officials the relations established with the Museums of the Continent invariably result in mutual benefit. The great question which all zoologists can discuss is that of nomenclature. This year a preliminary skirmish took place at Frankfort, where the annual meeting of the German Ornithological Society was held on May 11 and 12, under the presidency of Prof. Wilhelm Blasius, of Brunswick. The Senckenburg Museum at Frankfort had been closed for four years, and had been opened to the public only four days before the arrival of the visitors. Prof. Noll, the well-known editor of the *Zoologischer Garten*, welcomed the German Ornithological Society in a few well-chosen words, and then followed the discussion on zoological nomenclature, which occupied the best part of two days of hard work. The proposals of the Committee appointed to examine into and report on the rules of zoological nomenclature were fully discussed, and were adopted, though, by the courtesy of the members, Mr. Bowdler Sharpe, and Mr. Büttikofer, of the Leyden Museum, were allowed to state their objections to some of the propositions. The members and guests of the Society were conducted round the Museum by Prof. Noll and Dr. Hartert, and great satisfaction was expressed at the excellent condition in which Prof. Rüppell's types were found to be. The ornithological collection has been carefully catalogued by Dr. Hartert, and his recently-published catalogue of the collection is an admirable piece of work. At the conclusion of the meeting, an adjournment took place to the Zoological Gardens, where the visitors were hospitably entertained by the Director, who personally conducted them round the Gardens. From Frankfort a detachment of members and guests proceeded to Vienna and thence to Budapest, to attend the meeting of the Ornithological Congress.

MESSRS. MACMILLAN have nearly ready for publication "A History of Human Marriage," by Dr. Edward Westermarck, Lecturer on Sociology at the University of Finland, Helsingfors. In an introductory note the work is commended to the attention of students by Dr. A. R. Wallace, who expresses a high opinion of the learning and insight displayed by the author. Dr. Westermarck differs widely in many respects from the opinions hitherto held by most anthropologists as to the development of the various forms of marriage.

IN the House of Commons on Friday last, there was an interesting debate on the Ordnance Survey. Mr. Roby, who introduced the subject, had much to say as to the unsatisfactory rate at which the Survey is proceeding, and Sir George Campbell effectively contrasted the work done in England with that done in other countries. In India, he said, the surveys were incomparably ahead of those in the United Kingdom; he was often surprised at the perfection of the surveys even of those portions of that vast country only reached by sportsmen or explorers. "In his own country he found nothing of the kind. There, in one of the most cultivated and civilized places in the world, they had nothing but the old survey. It was a disgrace to the country that we should not have decent maps." Mr. Chaplin, under whose department the Ordnance Survey has been placed, said what he could in defence of existing arrangements, but was not disposed to deny that there was much solid ground for complaint. He promised that his influence should be used to secure reform in various directions.

THE University College Biological Society has arranged for an excursion to Sheerness on Saturday, June 6. The excursion will leave Victoria at 10 a.m., and the time at Sheerness will be spent either in dredging or shore work. The party will be accompanied by Prof. Weldon.

THE Eastern papers report that an expedition has, by order of the Straits Government, commenced work on the frontier between Burmah and the Malay Peninsula. Its operations will be chiefly confined to Pahang. It is placed under the charge of Mr. Ridley, Director of Gardens and Forests in the Straits Settlements, accompanied by Mr. William Davison, Curator of the Raffles Library, Singapore, and Lieutenant Kelsall, R.A. The funds available for the expedition are 2000 dollars voted from the Straits Treasury. The object is to ascend the highest mountain in Pahang, incidentally noting all that can be learned about the physical features and the flora and fauna of the country. The expedition was to go by steamer to Pekan; thence up stream to Kuala Lipis; thence northerly up the Tembelinis and Sat rivers. Having ascended the latter river so far as it may be navigable for small canoes, the expedition will strike through forest and jungle, estimated to extend for sixty miles, till they emerge at Gunong Tahan, which is said to be about 8000 feet high. Ascending this mountain, and crossing what is called Cameron's plateau, they will then ascend Gunong Siam, a mountain the height of which has been estimated to be as much as 14,000 feet. Having completed this ascent, they will return by the same route, the estimated period of absence from Singapore being between two and three months. The party were to take with them three Tamil hunters and collectors attached to Mr. Davison's Museum staff, and three Malays of the Gardens and Forests Department.

AT the meeting of the French Meteorological Society on May 5, a discussion by M. Millot of fifty years' observations at Nancy was presented. The temperature and rainfall values were divided into two periods, viz. 1841-79 and 1880-90. These averages showed that the mean temperature had considerably decreased since the winter of 1879-80, and that the amount of rainfall had increased; the climate showed a tendency to become more continental. M. Teisserenc de Bort communicated the results of his inquiries respecting a destructive tornado which visited the town of Dreux on August 18 last. At 10h. 5m. p.m., Paris time, a sharp clap of thunder occurred, followed by heavy rain and hail for about a minute, and five minutes later the tornado broke over the town with a noise resembling that of an express train, making a furrow in the ground, and in less than a minute tiles were flying about, trees uprooted, and several houses destroyed. After a short course the effects of the tornado ceased, and it appeared to rise to the upper strata of air, but descended again with equal violence near Epone about 60 kilometres distant, the rate of translation being about 29 miles an hour. The action of the electricity seemed to be of an unusual nature; although much damage was done by it, no metallic object was fused, but only traces of fusion could be found in bad conducting bodies. Among other incidents an iron bedstead was dismounted, without trace of fusion. The paper was illustrated by several photographs, showing the damage done in various parts of the path.

DR. J. HANN has communicated another important treatise to the Vienna Academy, entitled "Studies on the Conditions of Air-pressure and Temperature on the Summit of the Sonnblick, with remarks upon their importance for the theory of cyclones and anticyclones." The work is based upon four years' observations, and is divided into eight sections, viz.:—(1) An investigation of the general meteorological conditions under which the maxima and minima of air-pressure occur on the Sonnblick. The anomalies of pressure are more marked above than below, and are increased by the accompanying temperature anomaly, which is relatively high in barometric maxima, and relatively low in barometric minima. (2) The range of temperature during the passage of a barometric wave. This is, at least during the winter season, the opposite to that at the lower level. (3) Temperature with varying amount of cloud in winter. The highest temperature coincides with the least cloud, upon the summit, and conversely on the plain. The clear winter days on the Sonnblick have relatively high temperature with great dryness, and these conditions are characteristic of the barometric maxima. (4) Monthly maxima and minima of temperature. The former mostly occur during barometric maxima, and the latter when the high pressure lies in the west or north, and while a barometric minimum exists over Italy or the Adriatic. (5) Temperature and air-pressure on the Sonnblick during barometric minima over Central Europe, especially over the Eastern Alps. The mean temperature at the height of 6650 feet during the passage of barometric minima was below the normal, amounting on an average to 2°·5 F. during the winter season. The use of deviations of pressure and temperature in answering many questions of atmospheric physics is here discussed. (6) Vertical distribution of temperature, and mean temperature in a column of air of 3 kilometres in height. The calculations have been made separately for each winter. (7) Preliminary indications respecting the relations of the wind-directions to barometric maxima and minima. A considerable divergence (45°–90°) is shown from the directions as observed below, and the results confirm the conclusions drawn from cloud observations by J. A. Broun and others. (8) Refutation of some objections against the conclusiveness of temperature observations on mountain summits, and general remarks on cyclones and anticyclones. The author points out that recent mountain temperature observations and other facts are opposed to the explanation of barometric maxima and minima in extra-tropical regions by purely thermic considerations.

THE relations of weather and disease have been recently investigated by Herr Magelssen, of Leipzig, who, having formerly called attention to the nature of certain "waves" which recur in the variations of temperature (distinguishing waves of about 12 days, 50 days, and 18 to 20 years duration), now traces a connection of these with diseases and mortality. The year-waves especially show this connection; the mortality (in our latitudes) varying with the winter temperature. The least mortality (relatively) is at the middle part of the temperature periods. The injurious influence of heat is dominant in the more southern latitudes (such as Vienna), while cold begins to act beneficially. In northern places, mild winters prove injurious where several very mild winters come in succession (*e.g.* Stockholm in 1871–74). The most favourable conditions seem to be an alternation of moderately cold and moderately mild winters. Too much importance, the author thinks, has been attached to relative humidity. He further offers proof that infectious disease is even more dependent on weather than disease of the respiratory organs, or arising from chill.

THE value of systematic observation of snow is now being recognized in meteorology; and in Russia observations were commenced in January last year at 428 stations in the European portion of the Empire, 21 in the Asiatic, and 55 in the Caucasus. At first it was simply reported daily whether there was a continuous snow-covering about the station or not. But last winter the inquiry has been extended to the depth and general behaviour of the snow. Thus it is expected that in a few years, some valuable climatological material will have been accumulated at St. Petersburg. The report of Herr Berg on the snow in the early months of 1890, in European Russia (*Repert. für Meteor.*), contains a map showing the southern and western limit of the continuous snow-covering for the first and fifteenth of each of the months January to April. In the west the snow extended steadily till the beginning of March, the limit being then close to the Baltic. In the south-east, there was steady advance till February, and as far as the coast of the Caspian. In the south, the advance was fluctuating, there being a maximum in the middle of January, and the middle of February, both reaching to the Black Sea coast. The retirement of the snow-limit began in the south and south-east in the middle of February; in the west about half a month later. The general direction was north-east. On April 15 the limit passed through Onega on the White Sea, Wetluga, and Katherinenburg. By the first of May, all European Russia was free from snow. Herr Berg describes the weather accompanying the disappearance of the snow, and traces its causation.

A DIRECT observation of hail in the process of formation is recorded in the *Naturw. Rundschau.* In the afternoon of a squally day Prof. Tosetti, looking eastwards through the window of a house (in Northern Italy) which, with two others, enclosed a court, saw the rain which streamed down from the roof to the right, caught by a very cold wind from the north, and driven back and up in thick drops. Suddenly a south wind blew, and the drops, tossed about in all directions, were transformed into ice balls. When the south wind ceased, this transformation also ceased, but whenever the south wind recurred, the phenomenon was reproduced, and this was observed three or four times in ten minutes.

Engineering of the 29th ult. states that an extraordinary accident had occurred at the London-Paris Telephone Office in the Palais de la Bourse. One of the *employés*, a gentleman named Weller, wished to communicate with the London office on a matter of service. He had already rung up the English officials, and, the bell having sounded in reply, took up the receivers and put them to his ears, when he suddenly sustained a shock of electricity of such severity that it threw him staggering backwards against the door of the telephone cabinet, which, not having been properly fastened, flew open, with the result that he was thrown heavily to the ground. It appears from inquiries that similar accidents, although less serious, have occurred at this telephone office on several previous occasions. The officials attribute them to lightning striking the wire, either at San Gatte, where the submarine cable ends, or at the terminus of the land wire on the Palais de la Bourse. Such accidents, it is declared, might be easily prevented by the simple expedient of erecting lightning conductors at the point where the cable comes ashore, and at the terminus in Paris.

IN the nineteenth annual report of the directors of the Zoological Society of Philadelphia, attention is called to the unprecedented destruction of many of the more valuable and important animals of the native American fauna, and to the need for the immediate adoption of every means which can be employed to save them from complete extinction. The directors think that a good deal may be done in furtherance of this object, both in zoological gardens and private preserves. Of all the bisons now surviving outside the National Park, probably nine-tenths are comprised in a few herds owned by private individuals and zoological societies.

A FINE tortoise, weighing 87 pounds, obtained by the U.S. Fish Commission steamer *Albatross*, during her recent visit to the Galapagos Islands, has recently been deposited in the Zoological Park at Washington, D.C. The specimen was collected by Mr. C. H. Townsend on Duncan Island, and is of much interest, not only on account of the locality it represents, but as showing that Dr. Baur was a little hasty in deciding that *Testudo ephippium* is only a synonym of *T. abingdoni.* The Duncan Island tortoise agrees exactly with Dr. Günther's figure of *T. ephippium*, and is entirely distinct from the Abingdon Island species, which is also well-figured in Dr. Günther's paper. This figure shows a little emargination in the second marginal scute, which might seem accidental, but as it is exactly repeated in the specimen belonging to the U.S. National Museum, and as the emargination exists in the bony carapace, it is probably a constant specific character. Dr. Günther gives Indefatigable Island as the locality of *T. ephippium*, and if this be correct the species occurs on at least two islands of the group. Besides the Duncan Island Tortoise, examples of *T. vicina* and *T. nigrita* are now living in the Zoological Park, while the U.S. National Museum possesses skeletons of *T. abingdoni* (imperfect), *T. vicina*, and *T. nigrita*. The locality of this last-named species is still uncertain, but there is some reason to suppose that it may be from Chatham Island. *T. nigrita* has the most arched carapace of any species, *T. ephippium* and *T. abingdoni* the longest and anteriorly most compressed and elevated carapaces. Between these lie in the order named *T. microphyes* and *T. vicina*. There is a direct correlation between the anterior height of the carapace and the length of the neck, the rule being the higher the carapace the longer the neck, *T. nigrita* and *T. abingdoni* having respectively the shortest and longest necks. Mr. Townsend writes that tortoises are now extremely rare on Duncan Island.

THE June number of the *Zoologist* contains an interesting paper on the habits of the moose, by Mr. J. G. Lockhart. One of the points noted by the author is, that moose generally lie with the tail to windward, trusting to their senses of hearing and smelling, which are remarkably acute, to warn them of approaching danger from that quarter; they can use their eyes to warn them from danger to leeward, where hearing, and especially smelling, would be of little use. While they are sleeping or chewing the cud, their ears are in perpetual motion, one backward, the other forward, alternately. They also have the remarkable insight to make a short turn and sleep below the wind of their fresh track, so that anyone falling thereon and following it up is sure to be heard or smelt before he can get within shooting distance.

MR. L. UPCOTT GILL has published as a pamphlet a paper read by the Rev. H. A. Soames before the Bromley Naturalists' Society on the scientific measurement of children. Mr. Soames says he finds such measurements as he describes, taken every term, a good guide as to whether his pupils may be pressed with work or not. "If the increase is regular and the weight fair, according to the height, I do not fear to press them; but if, on the other hand, the weight is low, or if the height increases and not the weight, or if the increase in height is too rapid, I think it a very fair excuse for laziness, and take great care that too much work is not expected from them."

THE first volume of Sir William Thomson's "Popular Lectures and Addresses" (Macmillan), has reached a second edition. The third volume has also just been published, and the author hopes that the second volume may appear in the course of a year or two.

THE new number of the Journal of the Anthropological Institute (vol. xx., No. 4) opens with a paper in which Lady Welby calls attention to what she calls an apparent paradox in mental evolution. The number also includes a paper, by Mr. F. W. Rudler, on the source of the jade used for ancient implements in Europe and America; and the Presidential address delivered by Dr. Beddoe.

THE Botanical Society of Edinburgh has issued the eighteenth volume of its Transactions and Proceedings. Dr. Aitchison's "Notes on the Products of Western Afghanistan and of North-Eastern Persia," forming the first part of the volume, may be obtained separately.

TWO new parts (62 and 63) of the elaborate dictionary of Chemistry included in the "Encyclopaedie der Wissenschaften" (Breslau: Eduard Trewendt) have appeared. The eighth part of the hand-book of Physics, in the same Encyclopædia, has also been published.

THE ninth edition of "Telegraphy," by W. H. Preece and J. Sivewright (Longmans), has been published. The edition is described as "almost a new book." No fewer than 24 figures have been altered and 44 excluded, and there are now 265 as compared with 194 in the last edition. The authors have aimed at "providing such a general introduction to the art and science of telegraphy as will enable the student to proceed to the study of more advanced works, and give to the operator an intelligible explanation of the apparatus with which he has to deal."

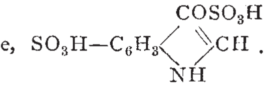
MESSRS. LONGMANS, GREEN, AND CO. are issuing the tenth edition of Quain's "Elements of Anatomy." It will appear in three volumes, and is being edited by Prof. E. A. Schäfer and Prof. G. D. Thane. The second part of the first volume—by Prof. Schäfer—has just been published. The subject is general anatomy or histology.

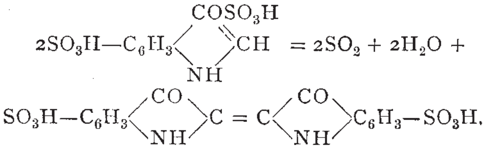
PART 32 of Cassell's "New Popular Educator" has been published. Besides illustrations in the text, it contains a coloured map of Switzerland.

THE Geological Survey Department of Canada has issued the first of a series of descriptive and illustrated quarto memoirs on the Vertebrata of the Tertiary and Cretaceous rocks of the Canadian North-West Territory, prepared for the Survey by Prof. E. D. Cope, of Philadelphia. The Report is devoted exclusively to a consideration of the species from the Lower Miocene deposits of the Cypress Hills, in the district of Alberta, and consists of twenty-seven pages of letterpress, illustrated by fourteen full-page lithographic plates. The second part, which will contain illustrated descriptions of the Vertebrates of the Laramie formation of the North-West Territory, by the same author, is now in course of preparation.

MR. PERCY F. KENDALL has prepared a little volume entitled "Hints for the Guidance of Observers of Glacial Geology." It is intended to serve as an answer to the requests for guidance which have been made by members of the North-West of England Boulder Committee. The work is printed only on alternate pages, so that students using it will have space for occasional brief notes.

"AN approved Treatise of Hawks and Hawking by Edmund Bert," 1619, has just been reprinted, with an introduction by Mr. J. E. Harting. It is the rarest of English books on falconry, and no copy has come into the market for nearly twenty years. The reprint is as nearly a facsimile as it is possible to make it without the aid of photography, and a hundred copies only have been printed. It is issued by Mr. Quaritch.

INDIGOCARMINE, the commercially important disulphonic acid of indigo, has been synthesized in an extremely simple manner by Dr. Heymann in the laboratory of Messrs. Bayer and Co. of Elberfeld, and a description of the mode of operation is given in the new number of the *Berichte*. The reaction merely consists in acting with excess of fuming sulphuric acid upon phenyl glycocoll, $C_6H_5—NH—CH_2—COOH$, the aniline derivative of glycollic acid. When a quantity of fuming sulphuric acid is poured upon a tenth of its weight of phenyl glycocoll in a test tube, the phenyl glycocoll rapidly dissolves, the acid becoming coloured yellow and slightly elevated in temperature, while sulphur dioxide commences to be evolved. If the solution is then poured over ice the greenish-blue colour of indigocarmine is at once obtained. The best conditions for working the process on the large scale are as follows. One part of phenyl glycocoll is mixed with ten to twenty times its weight of fine sand so as to avoid local superheating during the process of addition to the fuming acid. The mixture is then introduced into about twenty times its weight of fuming sulphuric acid at a temperature of about 20°-25°. The fuming acid should contain at least 80 per cent. of sulphuric anhydride, and the temperature should be so controlled that it never exceeds 30° during the process of adding the mixture. The yellow solution thus obtained yields instantly the blue coloration due to indigocarmine on removing the large excess of sulphuric anhydride by the addition of ordinary oil of vitrol, sulphur dioxide being evolved. Upon further diluting with ice and addition of common salt (indigocarmine being more difficultly soluble in salt solutions than in pure water) the colouring-matter is precipitated, and may be readily isolated. The product thus obtained is found to consist of pure indigocarmine. The tints obtained with this product are vastly superior in beauty and clearness to those obtained with even the better kinds of commercial indigocarmine, on account of the higher degree of purity attained by this mode of preparation. The chemical changes occurring during the process appear to be as follows. The first product of the action of fuming sulphuric acid upon phenylglycocoll appears to be the sulphonic acid of indoxyl sulphate,  . This substance, however, is unstable, and decomposes upon the removal of the excess of SO_3 into indigo disulphonic acid, sulphur dioxide, and water, probably according to the following equation—



Of course the most important point of commercial interest about a new reaction is the yield, and in this respect Dr. Heymann is very fortunate, for already 60 per cent. of the theoretical has been attained. The process has consequently been patented by Messrs. Bayer and Co., and appears likely to become a very successful one.

The additions to the Zoological Society's Gardens during the past week include a Water Buck (*Cobus ellipsiprymnus* ♀), a Leopard (*Felis pardus*), two Vulturine Guinea Fowls (*Numida vulturina*), two Mitred Guinea Fowls (*Numida mitrata*) from East Africa, presented by Mr. G. S. Mackenzie, F.Z.S.; a Peregrine Falcon (*Falco peregrinus*) from Scotland, presented by Mr. Thomas C. Smith; a Mountain Ka-Ka (*Nestor notabilis*) from New Zealand, presented by Mr. Herbert Furber; a Grey Squirrel (*Sciurus griseus*), a Squirrel (*Sciurus* sp. inc.) from North America, a Ducorp's Cockatoo (*Cacatua ducorpsi*) from the Solomon Islands, presented by Mr. Nicholas O'Reilly; two Ravens (*Corvus corax*) from Ireland, presented by Captain Ogilby; a Cheetah (*Cynœlurus jubatus*) from Persia, three Blandford's Rats (*Mus blandfordi*), two —— Terrapins (*Clemmys* sp. inc.) from India, deposited; two Coypus (*Myopotamus coypus*) from South America, two Andaman Starlings (*Sturnia andamanensis*) from the Andaman Islands, two Red-billed Hornbills (*Toccus erythrorhynchus*), two African White Spoonbills (*Platalea alba*) from Africa, two Virginian Eagle Owls (*Bubo virginianus*) from North America, purchased; a Red Deer (*Cervus elaphus* ♂), a Japanese Deer (*Cervus sika* ♀), born in the Gardens.

OUR ASTRONOMICAL COLUMN.

The Meridian Photometer.—In vol. xxiii. of the *Annals of the Harvard College Observatory*, Prof. E. C. Pickering and O. C. Wendell give and discuss the observations made at Cambridge, U.S., with the meridian photometer during the years 1882-88. The observations relate principally to stars north of the declination −40°. Vol. xiv. of the *Annals* contained the results of observations of the brightness of stars made with a small meridian photometer. The present volume deals with the photometric measurements of somewhat fainter stars, made by means of a similar but larger instrument.

Report of Harvard College Observatory.—Prof. Pickering has just issued his Report for last year. He again urges the necessity of a fire-proof building for storing the 27,000 photographic plates of spectra, 9000 of which were taken in 1890. Legacies for the endowment of science in America are so common that it is not surprising to learn that the Observatory has received a gift of 25,000 dollars through the late Mr. J. I. Bowditch. During the past year 1309 photographs of stellar spectra have been taken with the Bache telescope at the station near Closica, in Peru. Nearly all of them relate to the region south of −20°. Mrs. Draper has added another instrument of the same kind to the Henry Draper Memorial. This is mounted in the Observatory grounds at Cambridge, and since September 1889, 2157 photographs have been taken with it, covering the sky north of −20°. By placing a prism of small angle over the objective, the spectra of stars as faint as the tenth magnitude have been obtained. Six stars with Type IV. spectra have been discovered. Spectra of fifteen planetary nebulæ have been photographed. The hydrogen line F has been shown to be bright in eight stars. Bright line stars of the Wolf-Rayet type now number twenty-eight, three having been added to the list during the past year. The names are given of thirty variable stars of long period, in which the hydrogen lines are bright at maximum. This peculiarity has furnished a means of discovering seven new variable stars. The 11-inch telescope has been used for a detailed study of the spectra of the brightest stars, with the result that β Aurigæ and ζ Ursæ Majoris have been discovered to be close binaries. One photograph of σ Herculis seems to show that this star also is double, but this has not been confirmed. With the 12-inch telescope a number of "canals" on Mars have been recognized, but only one of them was distinctly seen to be double. An important accession to the white spot surrounding the southern pole was found by photographs to have occurred between the nights of April 9 and 10. The Report concludes with a list of the numerous publications issued by the Observatory during the year.

THE SOLAR PARALLAX AND ITS RELATED CONSTANTS.

It would be difficult to conceive a more masterly and comprehensive exposition of astronomical and physical constants than one just issued by Prof. W. Harkness, of the United States Naval Observatory. As is rightly pointed out, "The solar parallax is not an independent constant. On the contrary, it is entangled with the lunar parallax, the constants of precession and nutation, the parallactic inequality of the moon, the lunar inequality of the earth, the masses of the earth and moon, the ratio of the solar and lunar tides, the constant of aberration, the velocity of light, and the light equation." It should therefore be determined simultaneously with all these quantities by means of a least-square adjustment, and Prof. Harkness develops such a method. The equations connecting the constants are given, whilst the numerical values which are discussed are based upon an enormous mass of astronomical, geodetic, gravitational, and tidal observations which have required more than two hundred years for their accumulation. The sources of probable error are also examined, and it is suggested how some of the constants may be improved in the future. The completeness of the lists of constants, and the careful manner in which they are discussed and corrected by the comprehensive least-square adjustment which is developed, justifies our giving *seriatim* the results obtained:—

Equatorial semi-diameter of the earth—
3963·124 ± 0·078 miles.

Polar semi-diameter of the earth—
3949·922 ± 0·062 miles.

One earth quadrant—
10001816 ± 125·1 metres.

Oblateness or flattening of the earth—
1/300·205 ± 2·964.

Eccentricity of the earth—
0·006651018.